THE CRAZY ANT *ANOPLOLEPIS GRACILIPES* (SMITH) (HYMENOPTERA: FORMICIDAE) IN EAST ARNHEM LAND, AUSTRALIA

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Abstract

Anoplolepis gracilipes (Smith) was first recorded from the Australian mainland in East Arnhem Land, Northern Territory, in May 1990. In a survey during November 1999, it was found over five river drainage systems covering an area of approximately 2,500 km² but was mainly confined to thin strips of monsoon rainforest bordering perennial springs and streams. It was found only once in dry open *Eucalyptus* woodland. Highest populations were found in a disturbed habitat, although the ant was absent from Nhulunbuy town and aboriginal communities. The large area infested with *A. gracilipes* suggests that an eradication campaign would be extremely difficult.

Introduction

Crazy ant, *Anoplolepis gracilipes* (Smith) (= *longipes* (Jerdon)), is a tramp species thought to be native to Africa (Way and Khoo 1992). The ant has been spread by commerce throughout East Africa, Asia and the Pacific (Lewis *et al.* 1976). *A. gracilipes* is a pest of agricultural, domestic and natural environments (Lewis *et al.* 1976, Haines *et al.* 1994, Rao and Veeresh 1994) and, like many tramp species, forms unicolonial, polygynous colonies (Reimer 1994).

Crazy ant is frequently a pest of orchard crops because it nurtures sap-feeding insects. Copious amounts of honeydew produced by sap-sucking insects results in the growth of sooty mould on the leaves of fruit trees (Haines and Haines 1978a, Haines *et al.* 1994, Young 1996b). The ant often encourages pest species indirectly by harassing predators and parasites of the pests (Young 1996a). Additionally, *A. gracilipes* excavates around the roots of crops such as sugar cane and coffee, undermining the roots and causing the plants to collapse (Lewis *et al.* 1976, Haines and Haines 1978a, Rao and Veeresh 1994).

A. gracilipes is primarily a scavenger and will enter houses in search of food, which has led to the ant's reputation as a household pest (Lewis *et al.* 1976). It will also pester confined domestic animals, such as poultry (Haines and Haines 1978b, Haines *et al.* 1994).

The greatest impact of crazy ant is on the ecology of natural environments (Lewis *et al.* 1976, Haines and Haines 1978a, Haines *et al.* 1994). There are numerous reports of crazy ants displacing other invertebrate species (especially ants and spiders), forcing vertebrate species to vacate infested areas, attacking the young of nesting birds and altering the floral composition

(Lewis *et al.* 1976, Haines and Haines 1978a, Gillespie and Reimer 1993, Rao and Veeresh 1994, O'Dowd *et al.* 1999). A recent example is on Christmas Island, where *A. gracilipes* is having a detrimental effect on rainforest vegetation, populations of the red land crab *Gecarcoidea natalis* Pocock and nesting sea birds (O'Dowd *et al.* 1999).

A. gracilipes was first recorded from mainland Australia on the Gove Peninsula, East Arnhem Land, Northern Territory, following a survey by the Parks and Wildlife Commission of the Northern Territory during May 1990 (Reichel and Andersen 1996, Shattuck 1999). The collection locality was at Balkbalkbuy, 77 km south-west of Nhulunbuy airport, on the Katherine to Nhulunbuy road (N. Gambold, pers. comm.) (Fig. 1). Two of us (GAB and GRY) confirmed the presence of the ant at this site during October 1999. In view of the importance of *A. gracilipes* as an agricultural and environmental pest outside mainland Australia, it was decided to determine the distribution of the ant in East Arnhem Land and consequently the feasibility of an eradication campaign.

The vegetation of the Gove Peninsula mainly consists of tall, open woodland dominated by *Eucalyptus tetrodonta* and *E. minata* (Lynch and Wilson 1998). The woodland is interspersed with small areas of monsoon rainforest associated with perennial springs and streams (Wilson *et al.* 1990, Russell-Smith 1991).

Materials and Methods

During three days of investigation, the Gove Peninsula was searched on foot, by vehicle and quad bike. Preference was given to accessible areas on or near roads and tracks, especially near the upper reaches of watersheds, permanent watercourses and around aboriginal communities. Each individual inspection site had the GPS coordinates recorded and was investigated for 0.5 man-hours or until crazy ants were detected. Ants were visually located by raking leaf litter with sticks, searching where sooty mould was present on plants or by placing a small quantity of tuna-based cat food in 20 cm lengths of hollow bamboo. Representative samples were taken from each site where crazy ants were present.

Since personal experience of this ant in overseas countries had demonstrated the requirement for moisture and suitable nesting conditions, investigations were concentrated in areas where water, either above or below ground, was accessible. During the survey, accessible water was generally restricted to watercourses. The *Eucalyptus* woodland, which covers the great majority of the watershed areas, was affected by the prolonged absence of rain and the annual wild fires prevalent in this region.

Forty-nine sites were sampled from a range of habitats on the Gove Peninsula. Eleven of these were away from creek lines in *Eucalyptus* woodland.

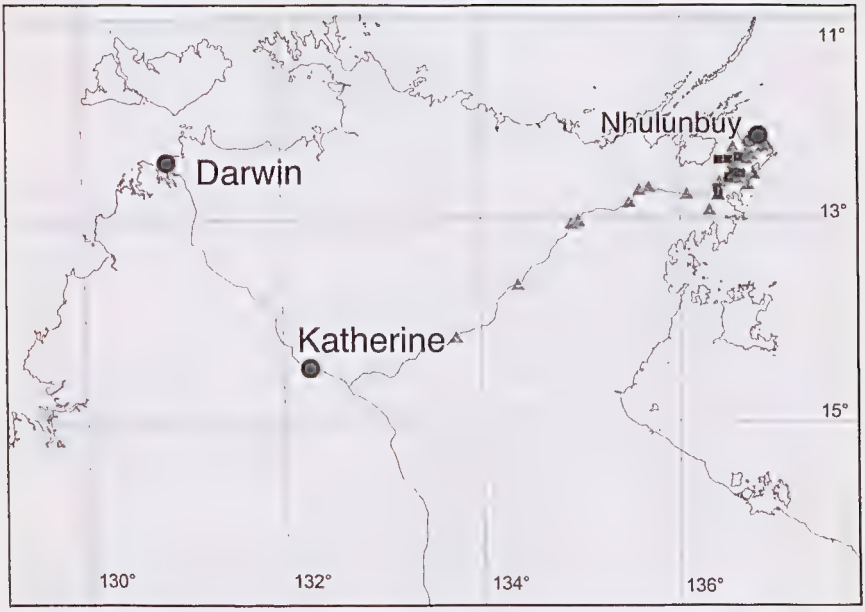

Fig. 1. Top End of the Northern Territory showing the Nhulunbuy to Katherine road and areas searched for *A. gracilipes* (■ = presence; ▲ = absence).

Results

Crazy ant was found in five drainage systems on the Gove Peninsula covering an area of approximately 2,500 km² (Fig. 2). The ant was absent from the port and town of Nhulunbuy as well as the nearby Yirrkala community. It was abundant around the first detection point at Balkbalkbuy, which is a permanent watercourse bordered by a thin strip of monsoon rainforest up to 5 m wide. Balkbalkbuy is used as a camping area and for parking earthmoving equipment. The resulting refuse and disturbance had encouraged the ant by providing shelter and nesting sites. Downstream from Balkbalkbuy, the ant was present and abundant for at least 700 m along the creek and for a further 200 m along a larger adjoining tributary. It was by far the dominant ant species in parts of the monsoon rainforest along the creek and appeared to have displaced native species of ant, including the green ant *Oecophylla smaragdina* (Fabricius). While crazy ants were found along the creek line, the ant had not invaded a dense patch of monsoon rainforest surrounding a spring, which feeds the creek at Balkbalkbuy.

At Balkbalkbuy, *A. gracilipes* formed large, interconnected soil colonies. Nests containing brood were also found under discarded car tyres and rubber mats. Tuna proved highly attractive to the ant with workers swarming around the bait within ten minutes of placement in the bamboo tubes. Additionally, the ant rapidly colonised the tubes; workers, alate and dealate queens, alate males and brood were present in tubes left out overnight.

The ant was less abundant in the other four drainage systems, being patchily distributed in shaded areas along creek banks and in the upper reaches of drainage systems. In one instance nests were found in a clay and shale creek bank above the normal wet season water level.

There appeared to be an association between the ant and monsoon rainforest growing along the creeks. This vegetation provided shade and leaf litter, creating a favourable habitat for the ant. The ant was not found in dry open woodland away from creek lines, except in one instance where a colony was found nesting in disturbed rock and soil beside the Katherine to Nhulunbuy road, possibly indicating that the ant had been transported there by earthmoving equipment or other vehicles.

Workers were observed climbing the trunks of trees and foraging over foliage but it was not apparent whether this indicated arboreal nests or ants searching for either sap-sucking homopterans or nectar. On one occasion *A. gracilipes* was observed tending *Saissetia* sp. (Hemiptera: Coccidae) on *Buchanania obovata* (Anacardiaceae), the leaves of which were covered in sooty mould. However, in other localities where the ant was found sooty mould was not detected on the vegetation.

Discussion

Anoplolepis gracilipes was found in shaded, moist areas of monsoon rainforest with a year-round layer of leaf litter and was generally absent from open *Eucalptus* woodland. Haines and Haines (1978b) in the Seychelles and Young (1996b) in Papua New Guinea showed that, while the ant would forage over 24 hours in tropical climates, maximum foraging activity occurred at temperatures ranging from 26-30°C and relative humidities from 65-90%. Rao and Veeresh (1991) observed maximum foraging activity at temperatures between 24 and 28°C. Temperatures in open woodland are often >34°C, free moisture is unavailable for 4-5 months of the year and the leaf litter is burnt during annual dry season fires. These conditions make the woodland an unfavourable habitat for the ant during the dry season. Conversely, the more permanent leaf litter and mulch layer of the monsoon rainforest (Bowman and Wilson 1988) provides *A. gracilipes* with a cooler and more stable habitat. The failure of crazy ant to colonise dense monsoon rainforest near Balkbalkbuy is unexplained.

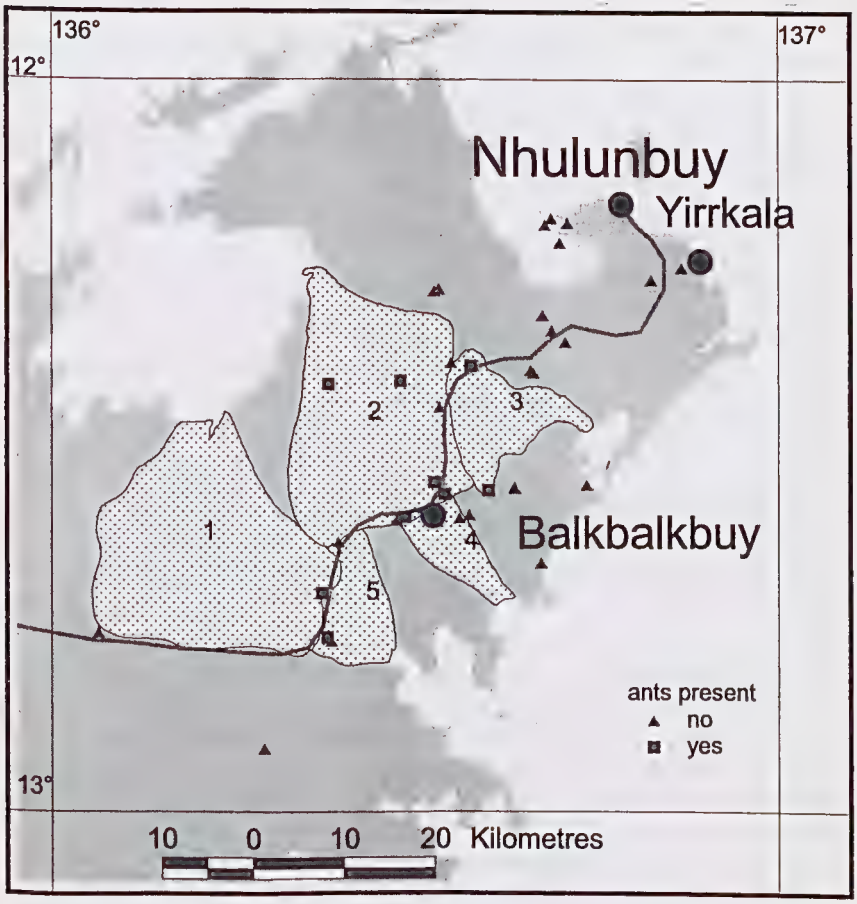

Fig. 2. Gove Peninsula, East Arnhem Land, showing the Nhulunbuy - Katherine road, five drainage systems and survey sites, indicating the presence or absence of *A. gracilipes*. Drainage systems: 1 = Goromuru River; 2 = Cato River; 3 = Wonga Creek; 4 = Balkbalkbuy Creek; 5 = Ngabinya Creek.

While both alate queens and males are known to fly, there is no evidence of mating flights and it appears that colonies reproduce by budding (Haines and Haines 1978b, Haines *et al.* 1994). During the wet northwest monsoon, conditions are probably favourable for sexuals and workers carrying brood to walk across open *Eucalyptus* woodland, enabling them to colonise new areas of monsoon rainforest. The dry season would isolate these new colonies from the original one. As demonstrated by the rapidity of colonising bamboo tubes, the ant can be spread readily by human activities. These factors could explain the patchy distribution of *A. gracilipes* on the Gove Peninsula.

Population density of *A. gracilipes* was greatest at Balkbalkbuy where the ant was able to construct large nests under refuse. The rapid colonisation of bamboo tubes suggests that the populations of *A. gracilipes* are limited by nesting sites in areas where the environment is favourable to the ant. In the Seychelles, Haines and Haines (1978b) concluded that population size was probably limited by the availability of food and nesting sites.

From work in the Seychelles and Christmas Island, it may be assumed that, on the Gove Peninsula, *A. gracilipes* obtains its protein by feeding on invertebrates inhabiting leaf litter in monsoon rainforests (Haines *et al.* 1994, O'Dowd *et al.* 1999). It is not immediately apparent where the ant sources carbohydrate, although it is likely to be either nectar or other plant exudates (Haines *et al.* 1994, Young, 1996a). Contrary to observations of ants tending homopterans on Christmas Island (O'Dowd *et al.* 1999), the ant was observed to tend honey-dew producing homopterans on only one occasion during this survey.

If *A. gracilipes* were to spread to tropical horticultural production areas the ant could damage sugar cane and tree crops as a result of excavating around root systems, encouraging sap-feeding insects and reducing the effectiveness of parasites and predators of pest species.

Monsoon rainforest occurs throughout north and north-western Australia as isolated patches (typically 1-10 ha), usually associated with permanent water, surrounded by vast areas of savanna woodland (Russell-Smith 1991). These rainforests have a very significant ant fauna (Reichel and Andersen 1996), which is an important component of biodiversity in the Northern Territory (Hoffmann *et al.* 1999). The exotic ant *Pheidole megacephala* (F.) has significantly reduced the richness and abundance of native ants and other invertebrates in a rainforest patch at Howard Springs near Darwin (Hoffmann *et al.* 1999). In view of observations made on the Gove Peninsula, *A. gracilipes* can be regarded as an equally serious threat to the invertebrate fauna of monsoon rainforests in northern Australia.

The detection of the ant in 1990 on an isolated creek bank more than 80 km from the nearest town and the subsequent discoveries of populations spread over 2,500 km^2, suggest that the ant has been established in the area for at least several decades. Furthermore, its presence along creeks far removed from human habitation suggests that the initial introduction could go back to mining exploration in the last 30 or 40 years, construction and military activities during the Second World War or even to the annual visits of Maccassan traders more than a century ago. There are undoubtedly populations of *A. gracilipes* on the Gove Peninsula that remain undetected and in view of the large and inaccessible area known to be infested, an eradication campaign would be very difficult.

Further dispersal of *A. gracilipes* by earth moving equipment and other vehicles from its current range is a continuing possibility and processes should be put in place to contain the ant in the Gove Peninsula.

Acknowledgments

We are grateful for the generous support and assistance given us by M. Storrs, Northern Land Council; K. Leitch, Nanakiya and Mangatjay, Dhimurru Land Management Aboriginal Corporation; N. Gambold, Central Land Council; officers of the Laynhapuy Homelands Resource Centre, the Yirkalla Dhanbul Landcare Group and the Nhulunbuy Corporation. J. Donaldson (Qld Department of Primary Industries, Brisbane) identified the coccid.

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